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THE ASTRONOMICAL LABORATORY AT GRONINGEN[1]

On the 16th of January it will be twenty-five years since the Astronomical Laboratory at Groningen was opened. Only three days later its director, Professor J. C. Kapteyn, will reach the age of 70, and will consequently have to retire as a professor and a director of the laboratory at the end of the current academical year. It is thus appropriate at the present moment briefly to review the work done by the laboratory during the 25 years of his directorate.

The official opening of the laboratory in 1896 was, however, not its first beginning. It may better be described as its coming of age. Unknown and hidden, without a proper home and without a name, it had existed at least ten years previously to its admission to the ranks of officially acknowledged institutions.

In the first period of his stay at Groningen (the Chair of Astronomy there was founded in 1878 and Kapteyn was its first occupant, being then only 27 years of age), Kapteyn's ambition was to erect a small observatory there—if possible with a photographic refractor as its principal instrument. If anybody had at that time suggested that his failure to attain this end would be the greatest boon to astronomy, and that he would do better without than with his observatory, I think Kapteyn himself would have scorned the idea, and so would every astronomer then living. Nevertheless, if he had got his observatory, the astronomical laboratory would never have been founded; and I think we can safely say that no other astronomical institution has had a more predominating influence on the direction in which science has developed during the first two decades of the present century. The characteristic feature of the laboratory, to which its exceptional position is due, is exactly that it has *no* means of its own for direct observation, and is entirely dependent for its material on co-operation with other astronomical institutions.

Not being able to get his observatory, Kapteyn looked for other work. For, though he was, and is, by the unanimous testimony of all his pupils, the most brilliant professor that ever lectured, for himself he could only find complete satisfaction in creative scientific work. This led to his co-operation with Gill and the production of the *Cape Photographic Durchmusterung*. This great work, involving more than a million measurements, was practically finished at the time of the official opening of the laboratory. It was entirely accomplished in two small rooms of the physiological laboratory in the University of Groningen, which had been put at Kapteyn's disposal in 1886 by its director, Professor Hinsinga. In 1896 the laboratory was provisionally housed in a private dwelling belonging to the government, from which it removed in 1903 to another temporary shelter—viz., the deserted mineralogical laboratory. From this small, though picturesque, building which had originally, I believe, been a stable for cavalry horses, emanated the discovery of the two star-streams (1904) and the *plan of selected areas* (1906). Finally, in 1913, a new physiological laboratory had been built, and the astronomical laboratory found a permanent home in the old building, the same from which it had started its peregrinations.

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[1] It is the policy of these PUBLICATIONS not to reprint articles which appear in other astronomical journals. But exceptions to any rule are occasionally in order and we take pleasure in reprinting from the January number of *The Observatory* this appreciation of the work of Professor J. C. Kapteyn. It will be remembered that Professor Kapteyn was awarded the Bruce Gold Medal of our Society in 1913, and that he is a Research Associate of the Carnegie Institution of Washington, spending much of his time, in the years preceding the war, at the Mount Wilson Observatory.—Committee on Publication.

In the first years of the work on the *C. P. D.*, Kapteyn had no other help than one computer, Mr. T. W. de Vries, by whom the greater part of the measurements for the *C. P. D.* were made, as well as for later investigations, and who still devotes his valuable services to the work of the laboratory. Gradually the staff of computers has been increased. In 1899 an assistant was appointed. This post was held successively by Messrs. Veenstra (1899), de Sitter (1900-1908), Weersma (1908-1913), Zernicke (1913-1915), and van Rhijn (since 1915). The establishment has thus always been a very modest one. All Kapteyn's work was done with the aid of only one scientific helper (who sometimes pursued his own investigations at the same time!) and a few computers. But all were inspired by Kapteyn's enthusiasm and indomitable energy.

From the beginning, probably already before he came to Groningen, Kapteyn devoted all his labours to the study of the problem of the constitution of the sidereal universe. All his work was undertaken with this purpose in view. Whether he investigated the systematic errors of our system of declinations, or elaborated the formula of differential refractions, or invented a new measuring-instrument—however deeply plunged he might be into the details of the special investigation in hand—the great problem was ever present to his mind and never for a moment lost sight of. This is the secret of his success. Seldom has there been such a complete and harmonious blending in one man of those two gifts, which would naturally appear to be, and actually often are, directly opposed to each other—viz., the wide outlook and comprehensive view of great problems, and patient and painstaking application to technical details of observations and computations. Never did he shrink from any labour, however great, to elucidate a doubtful point, perhaps uninteresting in itself, but necessary as a part of the whole: neither did he hesitate for one moment to stop as soon as the required accuracy was reached, and to forego giving the result further elegance and finish if these were not essential to the great problem.

During the whole of his career the two sides of the question—the collection of data and the elaboration of methods of discussion—have equally occupied his attention. Always he has been guided by the principle of getting from available data what could be got from them with available methods, both to test the methods which could lead to their improvements and in order to find out what further data were required. This is reflected in the contents of the *Publications* of the laboratory, of which No. 31 has just appeared. All of these with only one exception, (No. 17), contain either observational data bearing on the sidereal problem or discussions of such data and results derived from them. The most important observational data are determinations of parallaxes and proper-motions (considerably over 2000 of each) by methods devised by Kapteyn (depending on the principle of the latent photographic image), and derived almost exclusively from plates taken by Professor Donner at Helsingfors.

A direct outcome of Kapteyn's methods of working has been the startling discovery of the two star-streams, which has so deeply influenced our views regarding the structure of the sidereal universe, as also the direction of research during the last 15 years. Another consequence of this method, as well as of the nature of the problem, is that it made him entirely dependent on co-operation with other astronomers all over the world. This dependence, as already remarked, is the characteristic feature of the Groningen laboratory, and is clearly explained in the admirable speech with which Kapteyn opened the laboratory in 1896. This principle of co-operation finds its most complete embodiment in the well-known "plan of selected areas," born in the laboratory at Groningen, grown to maturity during that delightful voyage of the "Astronomical

Society of the Atlantic" to South Africa in the summer of 1905 and in Sir David Gill's room at the Cape Observatory. It was only after his name had by his previous work become so well known as to command universal respect that he could venture to propose such a plan to the astronomical world at large. The leading idea of it, however—viz., the concentration of observational efforts on a carefully drawn up programme, so designed as to produce the required data with the maximum of completeness and homogeneity with the minimum of labour,—is already clearly and emphatically expressed in the inaugural speech of 1896, and indeed has been the guiding principle of all Kapteyn's work.

By the publication and general adoption of this plan of selected areas, the work of the laboratory at Groningen has entered on a new phase. If its official opening in 1896 has been described as its coming of age, we can say that now it has settled down in life. In its youthful years it has done an immense amount of work of most fundamental importance. The new period has already been well begun, and we have every reason to expect that it has still a long future of brilliant scientific activity before it.